U.S. Department of Energy Smart Grid Investment Grant Technical Advisory Group Guidance Document #6

Topic: Recommendations for Content of the Consumer Behavior Study Evaluation Report(s)

October 23, 2012

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OBJECTIVE

This guidance document describes the content and layout for the evaluation reports that are a deliverable to the Department of Energy (DOE) by Smart Grid Investment Grant (SGIG) recipients who have agreed to undertake a consumer behavior study (CBS).

BACKGROUND

The Department of Energy (DOE) is requiring all SGIG recipients who have agreed to undertake a consumer behavior study to document the study's design, implementation and evaluation efforts after the first year of the study and after the second year of the study in a formal interim and final report, respectively. To make these documents as consistent as possible and therefore as useful as possible for both internal and external audiences, a standard format for the evaluation reports has been developed and is contained herein.[1]

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[1] A previous version of this guidance document (dated September 17, 2010) laid out, in outline form, what the evaluation reports would contain. This version provides much more detail about what that content should look like.

Section Heading	Description
1. Executive Summary	Summarize the objectives, design, customer recruitment/marketing, technology, operational and performance elements of the study. Comment on or provide an indication of what worked, what didn't, and what might seem practical for any future implementation decisions based on an integrated assessment of these various study elements.
2. Introduction	
1.a. Project Background	Provide a brief background on the genesis of the project
1.b. Project Overview	Provide a brief overview of the project's objectives and expected benefits associated with achieving these objectives
1.c. Questions of Interest	List the questions of interest that are being addressed as part of the project, and the impacts that are being estimated in the evaluation.
3. Project Description	
2.a. Design Elements	
2.a.i. Target Population	Provide a brief description of the target population of customers that was used to draw a sample of customers for participation in your project (e.g., all single family households within a certain geographic location).
2.a.ii. Treatments	Provide a description of: • All of the rate structures and values that applied to both the control and treatment customers throughout the study; • If a treatment used a baseline for paying for load reductions, then include the calculations for how that baseline would be set; • If the treatments include declaration of events, then describe the conditions for declaring an event as well as the structure (e.g. timing) for events; • If the treatments included some form of technology then include a description of the technology (e.g., main features, functionality, ease of use) that was offered to customers as part of the study (e.g., IHDs, PCTs), the method by which any technology involved in the study was to be provided to customers and installed at their premise (e.g., self-install vs. professional install, pre-provisioned vs. post-provisioned), including methods used to contact and follow up with customers; and • If the treatments included some form of information feedback, then include a description of the delivery mechanism and general content of that information as it related to the study.
2.a.iii. Randomization and assignment method	Provide a detailed description of the assignment method by which customers were selected, screened, recruited, enrolled, randomized, excluded, and placed into treatment and control groups including the order in which these assignment methods occurred. It should start with all of the customers in the utility territory, and then precisely describe the assignment process and each step that led to the customers being placed into their final groupings, including the decision mechanism for each step (e.g., allocated randomly, through opt-in / opt-out, with screening criteria, depending on technology installation, or through some other method). A

	flow diagram may be the best way to depict this randomization and assignment process (see Figure 1 below for an example).[2] This section should initially focus on the study design included in the filed and approved Consumer Behavior Study Plan. If implementation challenges caused the study's design to be altered in some way, then the reasons for the changes should be documented here along with what the final implemented study design looks like (as depicted in a second flow diagram). From this point forward, the evaluation report should focus on the implemented study design.
2.b. Implementation	
2.b.i. Project schedule	Provide a brief description of the project schedule and timeline.
2.b.ii. Recruitment and customer retention approach	Provide a description of the methods used to recruit customers and maintain customer involvement (e.g., advertisements, mailers, other forms of customer contact). If customers were provided with any incentives to participate or to remain in the study for its duration, then provide a description of the incentive approach used in the study.
2.b.iii. Recruitment and customer retention numbers	Provide a detailed description of the number of customers in each step of the assignment method (the numbers of customers that were selected, screened, recruited, enrolled, randomized, excluded, and placed into treatment and control groups). Also provide a description of the number of customers that were not retained during the study and the reason they were not retained (e.g., they dropped out, changed accounts, were excluded for some other reason). If technology was included as part of the study, then provide a detailed description of the number of customers who actually received the technology, installed the technology and used the technology (if such information was collected). A flow diagram may be the best way to depict the assignment and retention process and number of customers in each step (see Figure 1 below for an example).
2.b.v. Survey approach	Provide a detailed description of any administered surveys, including the population of customers that were asked to complete the surveys, the methods used to contact these customers, the number and percentage of customers by group (e.g., treatment, control) that completed the surveys, the timing of the surveys, and any other relevant information. Include a copy of the survey instrument(s) or list of questions for each survey in an appendix.
2.b.vi. Experience with enabling technology	Provide a detailed description of your utility's experience with any enabling technologies that were included as part of the study. In particular, describe any problems involved with the technology installation and/or operational performance of the installed technology. For example, list and describe: • Whether the technology established and maintained communication with the smart meter; • Problems with IHDs or web pages receiving data; • Problems with PCTs receiving signals; • Which customers had technology issues (e.g., problems receiving PCT signals or receiving data for IHDs or web pages, etc.)

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[2] LBNL has created their own version of these flow diagrams that describes the randomization and assignment methods employed in each recipient's study; contact atodd@lbl.gov if a recipient would like to use them in their interim or final evaluation report.

4. Data description	Provide a detailed description of the data collection and data cleaning.
	In the main body of the report:
	• List and describe the customers for which data was collected.
	• For each group of customers, describe the frequency (e.g., hourly, daily, yearly) and range of dates of the data collected and the data used in the analysis (e.g., for this group of customers, we collected hourly smart meter data from June 12, 2011-Sept 25, 2012).
	• Describe any demographic data or other customer specific characteristic data that you have for these customers.
	Either in the main body of the report or in an appendix[3]:
	• Describe any data values that were missing, imperfect, interpolated, or atypical in any way. For example, describe:
	   o Energy use data that were missing, negative or 0 (if negative or 0 is unlikely to be an accurate value)
	   o Energy use that was extremely high and deemed to be inaccurate
	   o Energy use that didn't pass a validation check for any reason (and describe the validation check)
	   o Energy use, demographic data, customers, dates, and times that were found to be outliers
	• Describe the specific customers, dates, and times that were included and excluded or changed. For example, list and describe:
	   o Days, times, or customers that were excluded or changed because they were deemed to be outliers or the data was deemed to be imperfect
	   o Customers that were excluded because of data issues (e.g., data for some customers were not recorded)
	   o Customers that were excluded because of technology issues (e.g., problems receiving PCT signals, issues receiving data on IHDs or web pages, etc.)[4]
	   o Customers that were excluded because they dropped out[4] or opted-out[4] or closed accounts
	• Describe any other data excluded or changed (e.g., due to missing or imperfect data), and the method by which it was changed (e.g., manually edited, interpolated linear average, estimated using a reference day, weather normalized, etc.). For example, describe:
	   o Missing energy data points that were excluded or changed in any way (e.g. interpolated to the average or reference load or some other number)
	   o 0s or negative energy data points that were excluded or changed to missing values or changed in any other way
	   o Extremely high energy data points that were excluded or changed in any way
	   o Energy data points that were excluded or changed because they were deemed to be outliers.
	• Describe any other relevant information about the data collected.

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[3] This information will allow the TAG to understand the population and times for which the results are applicable.
[4] Note that these customers should typically not be excluded. The effect of the treatment on the treated could be estimated as an RED design.

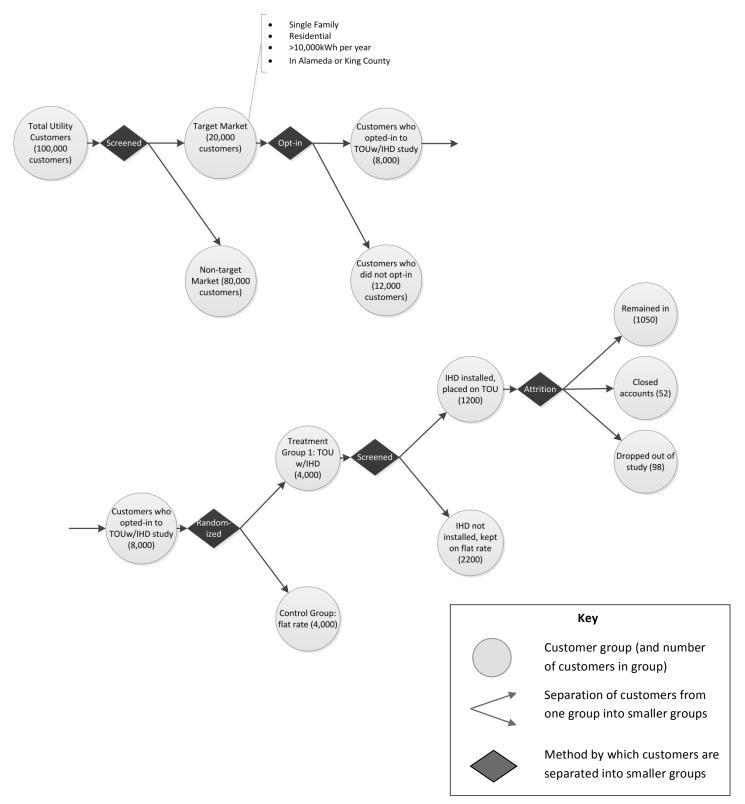| 5.	Analytical methodology(ies)	Provide a detailed description of the analytical methods used. See "SGIG Guidance Document 12 – LBNL Meta Analysis Framework" and the upcoming "Analysis Methods Guidebook" for a description of different methods. Each analysis method that is described should include, at a minimum:
		• The specific question being addressed in the analysis.
		• The reference load model describing the customer groups and times that are being compared (e.g., the change in energy usage between summer 2009 and summer 2010 for Treatment Group 1 compared to the same change in energy use for Control Group 1).
		• Provide validation of the reference load model (e.g., that the control and treatment groups were accurately randomized). See the upcoming "Analysis Methods Guidebook" for a description of randomization validity methods.
6.	Results	
	5.a. Impact evaluation results	• At a minimum, the results should include a load impact estimate for each rate, technology, and/or information treatment. The decision to estimate demand models is up to each recipient and dependent on the rate treatments included in the study, but is strongly encouraged where appropriate.
		• Each load impact estimate should have associated with it either in the body of the report or in a separate appendix:
		○ Its standard error;
		○ A p-value and/or confidence interval indicating statistical significance;
		○ The number of treatment customers, the number of control customers, and the total number of observations used in the analysis;
		○ A description of the dates and hours used in the analysis if it is a subset of the total amount of data collected (e.g., only the hours between 2-6pm during weekdays during July and August were included in the analysis); and
		○ A description of the customers used in the analysis if it is a subset of the total number of treatment and control customers
		• Each load impact estimate that is calculated should additionally be reported in the following four standardized formats (where the impact hour is the hour of interest for the evaluation, e.g., event hours for CPP rates or daily peak hours for TOU rates):
		○ The average kWh reduction per customer per impact hour (e.g., 0.5kWh per weekday peak hour per customer)
		○ The average percent energy reduction per impact hour (e.g., 40% per weekday peak hour per customer)
		○ The total energy conservation; the average kWh reduction per customer per month over all hours in that month (e.g., 40kWh per month per customer)
		○ The average percent energy reduction per month over all hours in that month (e.g., 4% per month per customer)
		• If demand models are estimated to produce elasticity values (e.g., own-price, cross-price, substitution), estimates should have

	associated with it either in the body of the report or in a separate appendix:
	- Its standard error; - A p-value and/or confidence interval indicating statistical significance; - The number of treatment customers, the number of control customers, and the total number of observations used in the analysis; - A description of the dates and hours used in the analysis if it is a subset of the total amount of data collected (e.g., only the hours between 2-6pm during weekdays during July and August were included in the analysis); and - A description of the customers used in the analysis if it is a subset of the total number of treatment and control customers
5.b. Process evaluation results	Provide a detailed description of the process evaluation that was undertaken that may include the following topics: customer recruitment, AMI and technology installations, back-office systems, information technology vendors, event dispatch and notification, and customer service. In addition, provide an assessment of how the results of the impact evaluation will impact future roll-outs of rate, technology and/or information feedback opportunities.
5.c. Additional results	Additional results may include: customer participation rates (initial enrollment and retention/attrition over time; load impact and/or elasticity estimates for different time durations (e.g., for certain months or certain hours); load impact and/or elasticity estimates for certain subsets of customers (e.g., for high energy usage customers); persistence of load impact and/or elasticity estimates over time; cost-effectiveness results; or any other informative analysis results.
7. Conclusions	Summarize the conclusions reached by the analysis with respect to questions of interest but also based on a more comprehensive assessment of the various elements of the study (e.g., customer recruitment/marketing, technology, operational performance, and load impacts) and describe implications, if any, for future offerings.
8. Appendices	
Appendix A: Survey Instruments	Include a copy of the survey instrument(s) or list of questions for each survey in an appendix.
Appendix B: Rate Tariffs	Include a copy of any applicable base rate, control group, and treatment group rate tariffs.
Appendix C: Technology Description	Include a picture of any technology devices (e.g., IHDs, PCTs, web-based feedback displays) used in the study.
Appendix D: Education Material	Include a copy of any educational materials (e.g., letters, emails, or web-based tips or other education) given to customers in the study.
Appendix E: Marketing Material	Include a copy of any marketing materials used to recruit customers for the study (e.g., mailers, advertisements, or phone contact).
Appendix F: Analysis Methodology and Results	Include any analysis methodology and results not included in the main body of the report.
Appendix G: Data Description	Include any relevant description of the data that was not included in the main body of the report.

Figure 1. Customer recruitment, assignment, and retention.